

A Synopsis of the Bornean Species of *Microcos* L. (Tiliaceae)

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Abstract

In preparing the treatment of the family Tiliaceae for the Tree Flora of Sabah and Sarawak Project, a revision of the genus *Microcos* in Borneo was conducted resulting in 27 species being recognised for Borneo, of which 25 species occur in Sabah and Sarawak; two (*M. laurifolia* and *M. tomentosa*) are newly recorded, three (*M. creaghii*, *M. elmeri* and *M. ovato-lanceolata*) are reduced to synonymy and one (*M. longipetiolata*) is excluded from the genus. Fifteen species are endemic to Borneo. A complete list of exsiccatae, nomenclatural (typification and synonymy) and taxonomic notes and distribution of the recognised species are provided.

Introduction

The genus *Microcos* L. was founded by Linnaeus in 1753 based on the Sri Lankan species, *M. paniculata* L. In 1767, Linnaeus reduced *Microcos* to the synonymy of *Grewia* L. In the past few decades, the delimitation and taxonomic status of *Microcos* and *Grewia* have been the subject of controversy. Recently, Bayer *et al.* (1999), Chung (2002, 2003), Bayer & Kubitzki (2003) and Chung *et al.* (2003, 2005) recognised *Microcos* as distinct from *Grewia* based on morphological, wood anatomical, leaf epidermal, pollen morphological characters and combined analyses of plastid *atpB* and *rbcL* DNA sequences.

Microcos species are found mainly in the Malesian region, with their centre of distribution probably in Borneo. Burret (1926) using morphological characters of the flower (such as the pedicel length, stamen number, ovary shape, ovule number per locule, and style length) recognised two subgenera within *Microcos*: subgen. *Microcos* Burret (species from Africa, Asia and West Malesia) and subgen. *Eumeriandra* Burret (species

from the Moluccas and New Guinea).

Up to 2005, a total of 97 binomials for *Microcos* had been published, representing taxa from tropical Africa to Indo-Malesia (The International Plant Names Index, 2005). Twenty-one binomials have been published for plants occurring in Borneo (Merrill, 1921; Masamune, 1942; Anderson, 1980; Ashton, 1988; Whitmore *et al.*, 1990; Kessler *et al.*, 1992; Kessler & Sidiyasa, 1994; Coode *et al.*, 1996; Argent *et al.*, 1997). In this paper, we recognise 27 species as occurring in Borneo.

Microcos L.

Microcos L., Sp. Pl. 1 (1753) 514, Gen. Pl. ed. 5 (1754) 230; Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 756; Merrill, Univ. Calif. Publ. Bot. 15 (1929) 185; Masamune, En. Phan. Born. (1942) 449; Backer & Bakhuizen *f.*, Fl. Java 1 (1964) 393; Meijer, Bot. News Bull. Sandakan 7 (1967) 107; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 241; Phengklai, Thai For. Bull., Bot. 16 (1986) 15, Fl. Thailand 6, 1 (1993) 33; Whitmore *et al.*, Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 357; Kessler *et al.*, Checkl. Tree Fl. Balikpapan-Samarinda Area (1992) 66; Kessler & Sidiyasa, Trees Balikpapan-Samarinda Area, Tropenbos ser. 7 (1994) 228; Turner, Gard. Bull. Sing. 47 (1995) 487; Coode *et al.*, Checkl. Flow. Pl. Gymno. Brunei (1996) 323; Boer & Sosef *in* Sosef *et al.*, Pl. Resources of South-East Asia 5, 3 (1998) 378. – *Grewia* L. subgen. *Microcos* (L.) J.R.Drumm. *in* Gamble, Fl. Madras 1, 1 (1915) 114. – *Grewia* L. sect. *Microcos* (L.) Wight & Arn., Prodr. Fl. Ind. Orient. 1 (1834) 81; King, J. Roy. As. Soc. Beng. 60, 2 (1891) 109. **Type species:** *Microcos paniculata* L.

Arsis Lour., Fl. Cochinch. ed. 1, 1 (1790) 335. **Type species:** *Arsis rugosa* Lour., Indo-China (= *Microcos paniculata* L.).

Fallopia Lour., Fl. Cochinch. ed. 1, 1 (1790) 335. **Type species:** *Fallopia nervosa* Lour., China, Canton [= *Microcos nervosa* (Lour.) S.Y.Hu].

Omphacarpus Korth. *in* Temminck, Verh. Nat. Gesch. Ned. Bezitt., Bot. 6 (1842) 192, Verh. Nat. Gesch. Ned. Bezitt., Bot. 5 (1842) t. 42. – *Grewia* L. sect. *Omphacarpus* (Korth.) Miq., Fl. Ind. Bat. 1, 2, 2 (1859) 204; King, J. Roy. As. Soc. Beng. 60, 2 (1891) 109. **Type species:** *Omphacarpus opacus* Korth., Borneo, Kalimantan [= *Microcos opaca* (Korth.) Burret].

Inodaphnis Miq., Fl. Ind. Bat., Suppl. 3 (1861) 357. **Type species:** *Inodaphnis lanceolata* Miq., Sumatra [= *Microcos lanceolata* (Miq.) Burret].

Grewia L. *p.p.*: King, J. Roy. As. Soc. Beng. 60, 2 (1891) 108; *p.p.* (*excl. G. umbellata* Roxb.); Ridley, Fl. Malay Penins. 1 (1922) 299, *p.p.* (*excl. G. umbellata* Roxb.); Kochummen *in* Whitmore, Tree Fl. Malaya 2 (1973)

396, p.p. (excl. *G. acuminata* Juss., *G. viminea* Wall. ex Burret et *G. sclerophylla* Roxb. ex Don); Corner, Wayside Trees Malaya 3rd edition, 2 (1988) 732, p.p. (excl. *G. umbellata* Roxb.).

Distribution: The genus comprises about 80 species occurring in tropical Africa (not Madagascar), India, Sri Lanka, Myanmar, Indo-China, S China, Hainan, Thailand, and throughout Malesia (except Lesser Sunda Islands). In Malesia, some 42 species are known with two centres of diversity: 36 species in the West Malesia and 16 species in the Moluccas and New Guinea. In Borneo there are 27 species with 15 endemics; Sarawak has 22 species with one endemic; Sabah 18 species with one endemic; Brunei 16 species (none endemic) and Kalimantan 16 species (none endemic).

Notes: Two basic inflorescence types are seen in *Microcos* (Chung 2001, 2003): Type A panicle where only first-order branches are conspicuous, and Type B panicle where at least two orders of branching are conspicuous.

Two domatia types, pocket- or sac-type, are found on the abaxial leaf surface either in the axils of basal pair of secondary veins or of other secondary veins in some species of *Microcos*.

Four main types of non-glandular trichomes were observed in *Microcos* (Chung, 2002), namely, simple, tufted (branched from the base upwards), stellate (star-shaped) and cushioned stellate trichomes.

1. *Microcos antidesmifolia* (King) Burret

Microcos antidesmifolia (King) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 780; Turner, Gard. Bull. Sing. 47 (1995) 487; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 323. – *Grewia antidesmifolia* King, J. As. Soc. Beng. 60, 2 (1891) 113; Ridley, Fl. Malay Penins. 1 (1922) 302; Kochummen in Whitmore, Tree Fl. Malaya 2 (1973) 397, p.p. (excl. syn. *G. antidesmifolia* King var. *hirsuta* King); Corner, Wayside Trees Malaya 3rd edition, 2 (1988) 733; Anderson, Checkl. Trees Sarawak (1980) 338; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 441, p.p. (excl. syn. *G. antidesmifolia* King var. *hirsuta* King and *M. subpetala* Stapf ex Ridl.); Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 355; Kochummen, Tree Fl. Pasoh (1997) 428. **Type:** King's Collector 4029, Peninsular Malaysia, Perak, Larut (lecto K., here designated).

Distribution: Peninsular Malaysia and Borneo.

Notes: In leaf shape, distance of the basal pair of secondary veins, and

fruit. *Microcos antidesmifolia* is closely related to *M. triflora* but differs in the leaf texture (chartaceous vs. subcoriaceous), basal pair of secondary veins running parallel to midrib at the base (absent vs. present), domatia type in the axil of basal pair (pocket-type vs. sac-type), petiole (not swollen vs. swollen), and the floral characters.

A species with two recognised varieties, in Borneo only var. *hirsuta* is known. The other, var. *antidesmifolia*, occurs in Peninsular Malaysia.

var. *hirsuta* (King) Burret

Microcos antidesmifolia var. *hirsuta* (King) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 780. – *Grewia antidesmifolia* King var. *hirsuta* King, J. As. Soc. Beng. 60, 2 (1891) 113; Ridley, Bull. Misc. Inform., Kew (1933) 489. **Type:** King's Collector 10185, Peninsular Malaysia, Perak (lecto K, here designated).

Microcos elmeri Merr., Univ. Calif. Publ. Bot. 15 (1929) 186; Masamune, En. Phan. Born. (1942) 450; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 323, *p.p.*, **syn. nov.** – *Grewia elmeri* (Merr.) P.S.Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 443; Anderson, Checkl. Trees Sarawak (1980) 338; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 356. **Type:** Elmer 20911, Borneo, Sabah, Tawau (A. BO, GH, K, L, NY, SING, UC).

Microcos creaghii Ridl., Bull. Misc. Inform., Kew (1933) 490, **syn. nov.**; Masamune, En. Phan. Born. (1942) 449. **Type:** Creagh s.n., Borneo, Sabah, Sandakan (K).

Distribution: Peninsular Malaysia (confined to Perak) and Borneo (Sarawak, Sabah, Brunei, and Kalimantan).

2. *Microcos borneensis* Burret

Microcos borneensis Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 772; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 357; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 323. – *Grewia borneensis* (Burret) P.S.Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 442; Anderson, Checkl. Trees Sarawak (1980) 338. **Type:** Haviland 2837, Borneo, Sarawak, Kuching (holo K; iso BO [3X], K, SAR, SING).

Distribution: Endemic in Borneo (confined to Sarawak and Brunei).

Notes: Burret (1926) erroneously cited *Hose* 2837 as the type. However,

the correct type specimen for this species is *Haviland 2837* (see Steenis, 1954) and the collection date of this specimen matches well with that cited by Burret (1926). Two sheets of this collection (at flower-bud stage) were examined at K. The sheet with the notes “flowers yellow” is the holotype, while the sheet with the notes “near *M. florida* of Sumatra, venation of leaves is different. It is not *Motleys 1216* or *1260*” is the isotype.

Microcos borneensis is closely related to *M. riparia* but the latter differs from the former by its larger and thicker leaves with a greater number of secondary veins (5–7 pairs), and longer inflorescences (3–8 cm long), lower part of the androgynophore is longer (1.5–2 mm long) and concave in side view, sparsely stellate-hairy style to between $\frac{1}{4}$ and $\frac{1}{2}$ its length, longer fruit (2.5–2.7 mm long) with 5–7 mm long pseudostalk, thicker mesocarp (5–6 mm thick), thinner endocarp (c. 0.5 mm thick), always with one fertile pyrene, and inconspicuous sterile pyrene.

3. *Microcos cinnamomifolia* Burret

Microcos cinnamomifolia Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 770; Merrill, Univ. Calif. Publ. Bot. 15 (1929) 187; Masamune, En. Phan. Born. (1942) 449; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 357; Kessler & Sidiyasa, Trees Balikpapan-Samarinda Area, Tropenbos ser. 7 (1994) 228; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 323; Boer & Sosef in Sosef *et al.*, Pl. Resources of South-East Asia 5, 3 (1998) 380. — *Grewia cinnamomifolia* (Burret) P.S. Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 443; Anderson, Checkl. Trees Sarawak (1980) 338; Argent *et al.* (eds.), Man. Non-Dipt. Trees Centr. Kalimantan 2 (1997) 641. **Type:** *Beccari PB 1617*, Borneo, Sarawak (lecto K, here designated; isolecto BO, L).

Distribution: Endemic in Borneo (Sarawak, Sabah, Brunei, and Kalimantan).

Notes: A very distinct species, it is the only *Microcos* with only a basal pair of secondary veins that reach almost to the apex of the blade. Nevertheless, it appears to be allied to *M. laurifolia*, with which it shares almost the same leaf shape (narrowly elliptic to elliptic or lanceolate to ovate).

4. *Microcos crassifolia* Burret

Microcos crassifolia Burret, Notizbl. Bot. Gart. Berl. –Dahl. 9 (1926) 780, *p.p.*; Merrill, Pl. Emer. Born. (1929) 186, *p.p.*; Masamune, En. Phan. Born. (1942) 449; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl.

Kalimantan 2, 1 (1990) 357; Kessler & Sidiyasa, Trees Balikpapan-Samarinda Area, Tropenbos ser. 7 (1994) 228. – *Grewia pyriformis* Merr., J. Str. Br. R. As. Soc. 86 (1922) 327, *p.p.*, *nom. illegit.*, *non G. pyriformis* Elmer, Leaf. Philip. Bot. 8 (1915) 2841. **Type:** *Ramos 1704*, Borneo, Sabah, Sandakan (holo K; iso L, US).

Distribution: Endemic in Borneo (confined to Sarawak, Sabah and Brunei).

Notes: In overall appearance, this species quite closely resembles *Microcos pachyphylla* from Borneo. However, it is sufficiently different to be maintained as a separate species (see note in *M. pachyphylla*). Oblong, ellipsoid or ovoid fruit galls, measuring 17–20 x 9–15 mm are sometimes found in this species.

5. *Microcos dulitensis* Airy Shaw

Microcos dulitensis Airy Shaw, Kew Bull. (1949) 159. – *Grewia dulitensis* (Airy Shaw) P.S. Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 443; Anderson, Checkl. Trees Sarawak (1980) 338; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 355. **Type:** *Richards 1767*, Borneo, Sarawak, Mt. Dulit (holo K; iso BO, SING).

Distribution: Endemic in Borneo (Sarawak). Reported only from Mt. Dulit and Usun Apau plateau.

6. *Microcos fibrocarpa* (Mast.) Burret

Microcos fibrocarpa (Mast.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 782; Phengklai, Thai For. Bull., Bot. 16 (1986) 54, f. 24; Phengklai, Fl. Thailand 6, 1 (1993) 38, f. 24; Turner, Gard. Bull. Sing. 47 (1995) 487; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 323, *p.p.*; Boer & Sosef in Sosef *et al.*, Pl. Resources of South-East Asia 5, 3 (1998) 380, *p.p.* (*excl. syn. Microcos reticulata* Ridl.). – *Grewia fibrocarpa* Mast. in Hooker *f.*, Fl. Brit. India 1, 2 (1874) 391; King, J. As. Soc. Beng. 60, 2 (1891) 111; Ridley, Fl. Malay Penins. 1 (1922) 301; Kochummen in Whitmore, Tree Fl. Malaya 2 (1973) 397; Anderson, Checkl. Trees Sarawak (1980) 338; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 444, *p.p.* (*excl. syn. M. reticulata*); Corner, Wayside Trees Malaya 3rd edition, 2 (1988) 733; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 356. **Type:** *Maingay 1080*, Peninsular Malaysia, Malacca (lecto K [with flower buds and fruits],

here designated; isolecto K [with flower buds], K [with fruits]).

Distribution: India (*fide* Phengklai 1993), peninsular Thailand, Peninsular Malaysia, and Borneo (Sarawak, Sabah and Kalimantan).

Notes: This species is easily confused with *Microcos reticulata*, but can be distinguished by the distantly and obscurely serrulate leaf margin, impressed midrib and secondary veins above, 1–1.5 mm long and glabrous lower part of the androgynophore, broadly ovoid or globose ovary, which is broadly ovate in cross section. It has soft indumentum on the twigs, lower leaf surface and infructescences.

7. *Microcos gracilis* Stapf ex Ridl.

Microcos gracilis Stapf ex Ridl., Bull. Misc. Inform., Kew (1938) 229; Masamune, En. Phan. Born. (1942) 450; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 323, *p.p.* – *Grewia gracilis* (Stapf ex Ridl.) P.S.Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 444; Anderson, Checkl. Trees Sarawak (1980) 338; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 356. **Type:** *Haviland 1509*, Borneo, Sarawak, Kuching (holo K; iso A, SING).

Distribution: Endemic in Borneo (Sarawak, Sabah, Brunei, and Kalimantan).

Notes: *Microcos gracilis* is closely related to *M. sumatrana* in having exclusively Type A panicles, glabrous lower part of the androgynophore, globose ovary, and densely stellate-hairy obovoid fruits. It is different in its basal pair of secondary veins reaching between $\frac{1}{4}$ and $\frac{1}{2}$ the length of the blade (vs. up to *c.* $\frac{1}{4}$ in *M. sumatrana*), petiole 0.5–1 mm long and not swollen at the distal end (vs. 1–1.5 mm, and slightly swollen at the distal end), narrowly elliptic and 0.5–1 mm wide involucre bracts of the inner whorl (vs. oblanceolate, 1–1.5 mm wide), oblong sepals (vs. linear or oblanceolate), oblong or obovate petals (vs. lanceolate), and in cross section the ovary is elliptic with three shallow ridges (vs. circular).

8. *Microcos henrici* (Baker f.) Burret

Microcos henrici (Baker f.) Burret, Notizbl. Bot. Gart. Berl.-Dahl., 9 (1926) 781, *p.p.*; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 241; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 323, *p.p.* – *Grewia henrici* Baker f., J. Bot. 62 (1924) 13. **Type:** *Forbes 3014*,

Sumatra, Palembang, Rupit River, Bingin (holo L [no. 908.144.547]; iso BO, GH, L [nos. 908.144.548, 908.140.1977, 409613], SING).

Distribution: Sumatra (Jambi and Palembang) and Borneo.

Notes: Two subspecies are recognised: subsp. *henrici* (represented by *Forbes 3014* and *Posthumus 1036*), which is endemic in Sumatra, and subsp. *acuta* R.C.K.Chung from Borneo.

subsp. *acuta* R.C.K.Chung

Microcos henrici (Baker f.) Burret subsp. *acuta* R.C.K.Chung, Kew Bull. 58 (2003) 242, fig. 5. **Type:** *Kostermans 12681*, Borneo, Kalimantan, Kutei, Belajan River, Tabang (holo L [no. 958.349.186]; iso L [no. 960.24.012], SING).

Grewia sp. 1, Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 447.

Distribution: Endemic in Borneo (confined to Sarawak, Sabah and Kalimantan).

9. ***Microcos hirsuta*** (Korth.) Burret

Microcos hirsuta (Korth.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 782; Merrill, Univ. Calif. Publ. Bot. 15 (1929) 185; Masamune, En. Phan. Born. (1942) 450; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 241; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 357; Kessler *et al.*, Checkl. Tree Fl. Balikpapan-Samarinda Area (1992) 66; Cheek & Turner, Kew Bull. 50 (1995) 129; Turner, Gard. Bull. Sing. 45 (1993) 221, Gard. Bull. Sing. 47 (1995) 487; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 324, *p.p.* – *Omphacarpus hirsutus* Korth. in Temminck, Verh. Nat. Gesch. Ned. Bezitt., Bot. 6 (1842) 193, Verh. Nat. Gesch. Ned. Bezitt., Bot. 5 (1842) t. 42. – *Grewia omphacarpa* Miq., Fl. Ind. Bat. 1, 2, 2 (1859) 204; Merrill, J. Str. Br. Roy. As. Soc., Spec. No. (1921) 373; Ridley, Fl. Malay Penins. 1 (1922) 301; Anderson, Checkl. Trees Sarawak (1980) 338; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 445, *p.p.*; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 356. – *Grewia hirsuta* (Korth.) Kochummen, in Whitmore, Tree Fl. Malaya 2 (1973) 39, *nom. illegit. et nom. superfl., non G. hirsuta* Vahl, Symb., Bot. 1 (1790) 34; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 240. **Type:** *Korthals s.n.*, Borneo, Kalimantan, Doesoen River (lecto L [no. 908.253.200], here designated; isolecto L [nos. 944.56.122–124,

908.253.353, 908.253.341–342]).

Grewia palembanica Miq., Fl. Ind. Bat., Suppl. 3 (1861) 405. **Type:** *Teijsmann HB 3658*, Sumatra, Palembang, Muara Enim (BO, L [no. 908.253.799], U n.v.).

Distribution: Sumatra, Peninsular Malaysia, Singapore, and Borneo (Sarawak, Sabah, Brunei, and Kalimantan).

Notes: *Microcos hirsuta* is closely related to *M. phaneroneura* (see note under *M. phaneroneura*).

10. *Microcos kinabaluensis* R.C.K.Chung

Microcos kinabaluensis R.C.K.Chung, Kew Bull. 58 (2003) 330, fig. 1. **Type:** *Chew & Corner RSNB 4994*, Borneo, Sabah, Mt. Kinabalu, Mesilau River (holo SING; iso SAN, US).

Distribution: Endemic to Borneo (Mt. Kinabalu, Sabah).

11. *Microcos latifolia* Burret

Microcos latifolia Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 781. – *Grewia latifolia* Mast. in Hooker f., Fl. Brit. India 1, 2 (1874) 392, *non G. latifolia* F.Muell. ex Benth. in Bentham & Mueller, Fl. Austral. 1 (1863) 271; King, J. As. Soc. Beng. 60, 2 (1891) 112; Gagnepain in Lecomte, Not. Syst. 1 (1909) 132; Ridley, Fl. Malay Penins. 1 (1922) 300. – *Grewia blattaefolia* Corner, Gard. Bull. S.S. 10 (1939) 262; Kochummen in Whitmore, Tree Fl. Malaya 2 (1973) 399; Anderson, Checkl. Trees Sarawak (1980) 338; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 442, *p.p.*; Corner, Wayside Trees Malaya 3rd edition, 2 (1988) 733; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 355; Kochummen, Tree Fl. Pasoh (1997) 429. – *Microcos blattaefolia* (Corner) R.S.Rao, J. Bomb. Nat. Hist. Soc. 48 (1949) 300, *p.p.*; Turner, Gard. Bull. Sing. 45 (1993) 221, Gard. Bull. Sing. 47 (1995) 487; Boer & Sosef in Sosef *et al.*, Pl. Resources of South-East Asia 5, 3 (1998) 380. **Type:** *Maingay 3150* (= Kew Distr. No. 249), Peninsular Malaysia, Malacca (lecto K, here designated).

Distribution: Peninsular Malaysia, Singapore and Borneo (confined to Sarawak and Brunei).

Notes: *Microcos latifolia*, a highly variable species with respect to vegetative characters, is sometimes confused with *M. globulifera* from Peninsular Malaysia. Two rather distinct entities can be recognised. The first, represented by specimens collected from Peninsular Malaysia and Singapore are characterised by elliptic to broadly elliptic leaves with an acute or obtuse apex and impressed hairy midrib and secondary veins above; and the second by specimens from Sarawak and Brunei which have narrowly elliptic leaves with acuminate apex, and raised glabrous midrib and secondary veins above.

The name *Microcos latifolia* (Mast.) Burret (Burret, 1926: 781) is an illegitimate name because it was based on an illegitimate basionym (*Grewia latifolia* Mast., 1874, *non G. latifolia* Benth. & F. Muell, 1863). In accordance with the International Code of Botanical Nomenclature 2000 (St. Louis Code) Art. 58.3 with Ex. 2 (Greuter *et al.*, 2000), the correct name for the species is *Microcos latifolia* Burret with no parenthetic author citation.

The epithet of “*blattaefolia*” is not to be changed to “*blattifolia*” since Corner (1939) avowedly based it on *Blatta*, the Latin name for the cockroach used by Pliny, Vergil, Horace, etc., and has nothing to do with *Blatti* Adanson, a listed rejected name in the synonymy of *Sonneratia nom. cons.*

12. *Microcos latistipulata* (Ridl.) Burret

Microcos latistipulata (Ridl.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 795; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 241; Turner, Gard. Bull. Sing. 47 (1995) 487; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 324, *p.p.* – *Grewia latistipulata* Ridl., Bull. Misc. Inform., Kew (1924) 262, Fl. Malay Penins. 5 (1925) 293; Anderson, Checkl. Trees Sarawak (1980) 338; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 444, *p.p.* (*excl. syn. M. crassifolia* Burret *et M. pachyphylla* Merr.); Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 356. **Type:** Burkill SFN 7826, Peninsular Malaysia, Selangor, Klang (holo K; iso SING).

Distribution: Sumatra, Peninsular Malaysia and Borneo.

Notes: A species with two recognised varieties: var. *latistipulata* is known only from Peninsular Malaysia and Borneo and var. *lanceolata* (Ridl.) Burret from Sumatra.

var. *latistipulata*

Distribution: Peninsular Malaysia and Borneo (confined to the east coast of Sabah).

Notes: *Microcos latistipulata* is characterised by the coriaceous and glabrous leaves, as well as by the distinctly sharply prominent midrib and secondary veins beneath, and glabrous pyriform fruits with pseudostalk. Specimens of var. *latistipulata* from Borneo differ from the Peninsular Malaysian ones by their glabrous lower part of the androgynophore (vs. stellate-hairy) and glabrous ovary (vs. stellate-hairy). However, the presence of a number of specimens with intermediate characters means that the populations in Peninsular Malaysia and Borneo should be grouped under var. *latistipulata*. Some of these intermediate specimens are: *Charington* SAN 24716, *Elmer* 20310 and *Meijer* SAN 25133.

13. *Microcos laurifolia* (Hook.f. ex Mast.) Burret

Microcos laurifolia (Hook.f. ex Mast.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 771; Phengklai, Thai For. Bull., Bot. 16 (1986) 56, f. 25, Fl. Thailand 6, 1 (1993) 39, f. 25; Turner, Gard. Bull. Sing. 47 (1995) 487; Boer & Sosef in Sosef *et al.*, Pl. Resources of South-East Asia 5, 3 (1998) 381. — *Grewia laurifolia* Hook. f. ex Mast. in Hooker f., Fl. Brit. India 1, 2 (1874) 392; King, J. As. Soc. Beng. 60, 2 (1891) 114; Baker f., J. Bot. 62 (1924) 13; Kochummen in Whitmore, Tree Fl. Malaya 2 (1973) 399; Corner, Wayside Trees Malaya 3rd edition, 2 (1988) 733; Kochummen, Tree Fl. Pasoh (1997) 429. **Type:** *Maingay* 1647, Peninsular Malaysia, Malacca (lecto K [with flower buds], here designated; isolecto K [with fruits]).

Distribution: India (*fide* Phengklai 1993), peninsular Thailand (*fide* Phengklai 1993), Sumatra, Peninsular Malaysia, and Borneo (confined to Brunei).

Notes: The specimen from Brunei (*Dransfield et al.* JD 6825) represents a new record of the species for Borneo. The young twigs, petioles, midrib and secondary veins of this specimen are covered with simple hairs (vs. glabrous, except for the sparsely minutely stellate-hairy petioles for the Peninsular Malaysian specimens).

Morphologically, *M. laurifolia* is closely allied to *M. florida* (Miq.) Burret and *M. loerzingii* Burret (from Sumatra), *M. pyriformis* (Elmer) Burret (from the Philippines) and *M. kinabaluensis* (from Borneo; see Chung (2003) for further details).

Microcos florida differs from *M. laurifolia* by its hairy sac-type domatia (vs. glabrous pocket-type), densely stellate-hairy ovary (vs. sparsely

covered with glandular trichomes in buds and less in flowers), fruits with a short remnant of style (vs. without a style remnant), endocarp of less than 0.5 mm thick (vs. 0.5–1 mm thick), and consistently 1 fertile pyrene (vs. 1–2).

Microcos laurifolia can be distinguished from *M. loerzingii* by its equilateral leaf base (vs. inequilateral, i.e. with halves or sides unequal in shape and size), thinner (1–1.5 mm) petioles (vs. c. 2 mm thick), sparsely simple- or minutely stellate-hairy petioles (vs. glabrous), ovary sparsely covered with glandular trichomes (vs. densely stellate-hairy), and glabrous style (vs. sparsely stellate-hairy).

From *M. pyriformis*, *M. laurifolia* differs by the concolourous subcoriaceous leaves (vs. discolourous chartaceous leaves), pyriform fruits with distinct pseudostalk (vs. obovoid without pseudostalk), smaller fruits 1.5–2 x 0.8–1.3 cm (vs. 2.5–3 x 1.8–2 cm), thinner (1–1.5 mm) mesocarp (vs. 4–6 mm thick), thinner (0.5–1 mm) endocarp (vs. 1–2 mm thick), consistently with 1–2 fertile pyrenes (vs. 1), and shorter (4–6 mm) fertile pyrenes (vs. 8–10 mm long).

Baker f. (1924), Ashton (1988) and Kessler *et al.* (1992) reported that *M. laurifolia* occurs in Palembang, Sumatra (specimens Baker f. 3005 and 3146), Sarawak (Ridley s.n.) and Kalimantan (S 292) respectively. However, during this study we could not locate these specimens in order to confirm their identity.

Ridley (1938) identified one collection from Sarawak (Beccari PB 3473) as that of *M. laurifolia*. Careful study of the specimen revealed that it belongs to *M. riparia*.

14. *Microcos membranifolia* R.C.K.Chung

Microcos membranifolia R.C.K.Chung, Kew Bull. 58 (2003) 336, fig. 3.

Type: Singh SAN 30672, Borneo, Sabah, Sandakan, Sungai Binuang (holo KEP; iso K, SAN, SAR, SING).

Distribution: Endemic in Borneo (confined to Sarawak and Sabah).

15. *Microcos opaca* (Korth.) Burret

Microcos opaca (Korth.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 781; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 357; Kessler *et al.*, Checkl. Tree Fl. Balikpapan-Samarinda Area (1992) 66. – *Omphacarpus opacus* Korth. in Temminck, Verh. Nat. Gesch. Ned. Bezitt., Bot. 6 (1842) 193. – *Grewia opaca* (Korth.) Miq., Fl. Ind. Bat. 1, 2, 2 (1859) 204; Merrill, J. Str. Br. Roy. As. Soc., Spec.

No. (1921) 373; Masamune, En. Phan. Born. (1942) 449; Anderson, Checkl. Trees Sarawak (1980) 338; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 446. **Type:** *Korthals s.n.*, Borneo, Kalimantan, Gunung Sakoembang (lecto L [no. 908.253.752], here designated; isolecto L [no. 908.253.767]).

Distribution: Endemic in Borneo (confined to Sarawak, Sabah and Kalimantan).

Notes: This species is sometimes confused with *M. henrici* subsp. *acuta* because of its leaf shape, inequilateral leaf blade, and flattened midrib above. *Microcos opaca* is sufficiently different in its inflorescence type, filament and style indumentum, ovary shape, and fruit shape. Additionally, it has acuminate leaves and the acumen with blunt tip.

16. *Microcos ossea* Burret

Microcos ossea Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 779; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 357; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 324, *p.p.* – *Grewia ossea* (Burret) P.S. Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 446, *p.p.*; Anderson, Checkl. Trees Sarawak (1980) 338. **Type:** *Haviland 42*, Borneo, Sarawak, Kuching (lecto K [with flower buds and flowers], here designated; iso BO, K [with young and mature fruits], L [no. 908.254.267], SING).

Microcos paucicostata Burret, Notizbl. Bot. Gart. Berl.-Dahl. 12 (1935) 602; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 358. **Type:** *Clemens 21071*, Borneo, Sarawak, Kapit (A, K, NY, SAR).

Distribution: Endemic in Borneo (Sarawak, Sabah, Brunei, and Kalimantan).

Notes: In his original publication for the species, Burret (1926: 779) did not specify the collector and collection number of the type. However, under the distribution note, he stated that the species was described based on a specimen on loan from K collected from a small tree near Kuching on 2 March 1893. We have examined specimens deposited at BO, K, L, and SING and found that *Haviland 42* bears the same notes on the habit, locality and date of collection. Based on this, we concluded that *Haviland 42* is the type of *Microcos ossea* Burret and here designate it as such.

17. *Microcos pachyphylla* Merr.

Microcos pachyphylla Merr., Univ. Calif. Publ. Bot. 15 (1929) 187; Masamune, En. Phan. Born. (1942) 450. **Type:** *Elmer 21880*, Borneo, Sabah, Tawau (holo US; iso A, BO, K, L, NY, SING).

Distribution: Endemic in Borneo (confined to Sabah, Brunei and E Kalimantan). This species is common in Sabah and Kalimantan but rare in Brunei. In Sabah, it is found mainly in the east coast districts (Sandakan and Tawau), with one collection from Beaufort on the west coast.

Notes: *Microcos pachyphylla* is closely related to *M. crassifolia*. In both species the leaf is coriaceous and glabrous, the mesocarp is dorsilaterally ribbed, and the specimens of fruits are often infested with galls. The former, however, differs from the latter in having leaves shiny on both surfaces (vs. not shiny), short petioles of less than 12 mm long (vs. 7–18 mm long), and globose fruits (vs. ellipsoid or obovoid). Fruit galls, ovoid to broadly ovoid or occasionally ellipsoid to oblong and measuring (9–)12–14 x 9–12 mm, are often found in this species.

18. *Microcos pearsonii* (Merr.) Burret

Microcos pearsonii (Merr.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1927) 1171; Merrill, Univ. Calif. Publ. Bot. 15 (1929) 185; Masamune, En. Phan. Born. (1942) 450; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 358; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 324. – *Grewia pearsonii* Merr., Philipp. J. Sci. 30 (1926) Bot. 83; Masamune, En. Phan. Born. (1942) 449; Anderson, Checkl. Trees Sarawak (1980) 338; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 447. **Type:** *Wood 1216*, Borneo, Sabah, Kudat, Lingkongan River (holo UC [barcode UC 232336]).

Distribution: Endemic in Borneo (confined to Sarawak, Sabah, and Brunei).

Notes: The collections from Sarawak and Brunei have longer (9–15 mm long) and sparsely stellate-hairy petioles and differ from the “typical” collections from Sabah which have shorter petioles (2–7 mm long) and are densely stellate-hairy. A number of collections (e.g., *Dewol & Donggap SAN 129474* from Sabah and *Nielsen & Balslev 1109* from Brunei) have the secondary veins and tertiary venation impressed above which differ from those of the “typical” collections.

Microcos pearsonii, with its cordate leaf base, is distinctive among the Bornean species of *Microcos*. It is closely allied to *M. erythrocarpa* and *M. malayana* from Peninsular Malaysia, but differs from both by its cordate leaf base, type of indumentum of the twigs, veins, petioles, inflorescences and infructescences, and by its floral characters.

19. *Microcos phaneroneura* Burret

Microcos phaneroneura Burret, Notizbl. Bot. Gart. Berl.-Dahl. 12 (1934) 163; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 358; Kessler *et al.*, Checkl. Tree Fl. Balikpapan-Samarinda Area (1992) 66. **Type:** Hallier 2868, Borneo, Lianggagang (holo BO [with white specimen tag; iso BO [without white specimen tag], SING).

Distribution: Endemic in Borneo (confined to Sarawak, Brunei and Kalimantan).

Notes: *Microcos phaneroneura* is closely related to *M. hirsuta* in the smooth twigs, basal pair of secondary veins reaching between $\frac{1}{4}$ and $\frac{1}{2}$ the length of the blade and forming an angle of less than 45° from midrib, lanceolate petals, and smooth in the lower part of the androgynophore. However, the former differs from the latter by its chartaceous leaf (vs. subcoriaceous), sparsely simple- and stellate-hairy leaf above (vs. glabrous), impressed secondary veins and tertiary venation (vs. flattened), exclusively Type A panicles (vs. mixture), lanceolate involucre bract lobes of the outer whorl (vs. ovate), narrowly elliptic involucre bracts of the inner whorl (vs. oblanceolate), acuminate petals (vs. with shallow 2–3 teeth), and sparsely stellate-hairy lower part of the androgynophore with cylindrical side view (vs. glabrous with concave side view).

20. *Microcos reticulata* Ridl.

Microcos reticulata Ridl., Bull. Misc. Inform., Kew (1933) 490, p.p.; Masamune, En. Phan. Born. (1942) 450; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 324. **Type:** Creagh s.n., Borneo, Sabah (holo K; iso K).

Distribution: Sumatra and Borneo (Sarawak, Sabah, Brunei, and Kalimantan). Very common in Borneo.

Notes: Two sheets of *Creagh s.n.* collection (at flower-bud stage) were examined at K. The sheet with a white envelop and a determination slip by

J.R. Drummond is considered the holotype, while the other sheet without the envelop and Drummond's determination slip is the isotype.

Ridley (1933) cited specimen *Anderson 160* from Sarawak as belonging to *M. reticulata*. However, this specimen has elliptic leaves with an unequal base and pyriform fruits with narrowed pseudostalk, and thus matches well with *Haviland 1685* belonging to *M. stylocarpoides* Burret, a species restricted to Sarawak and Kalimantan.

21. *Microcos riparia* (Boerl. & Koord.) Burret

Microcos riparia (Boerl. & Koord.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 795; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 241. – *Grewia riparia* Boerl. & Koord. in Koorders-Schumacher, Syst. Verz. 2 (1911) 35. **Type:** *Koorders 10450b*, Sumatra (holo BO).

Microcos ovato-lanceolata Burret, Notizbl. Bot. Gart. Berl.-Dahl. 12 (1934) 163, **syn. nov.**; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 358; Kessler *et al.*, Checkl. Tree Fl. Balikpapan-Samarinda Area (1992) 66; Argent *et al.* (eds.), Man. Non-Dipt. Trees Centr. Kalimantan 2 (1997) 641. **Type:** *Hallier 1314*, Borneo, Kalimantan, Sungai Keniboeng (BO [3X]).

Distribution: Sumatra, Peninsular Malaysia (only recorded in Rompin FR, Pahang) and Borneo (confined to Sarawak and E Kalimantan, recorded in the area around Sungai Keniboeng, Sungai Kenepai, and Wanariset Research Institute).

Notes: Burret (1934) distinguished *Microcos ovato-lanceolata* from *M. riparia* solely by its lanceolate to ovate leaves with obtuse to rounded base (vs. broadly ovate with truncate base in *M. riparia*). Detailed study on the available specimens of both species showed that these distinguishing characters of the leaves intergrade. In addition, the fruits of the two species also possess many similar characters. In conclusion, *M. ovato-lanceolata* is here reduced to the synonymy of *M. riparia*.

Sterile specimens of *M. riparia*, especially those with small leaves, can be easily confused with *M. borneensis*. However, the latter can be distinguished by its glabrous older twigs and leaves, chartaceous leaves, and brown leaf colour when dried (see note under *M. borneensis*).

22. *Microcos stylocarpoides* Burret

Microcos stylocarpoides Burret, Notizbl. Bot. Gart. Berl.-Dahl. 12 (1934) 162; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1

(1990) 358; Kessler *et al.*, Checkl. Tree Fl. Balikpapan-Samarinda Area (1992) 66; Argent *et al.* (eds.), Man. Non-Dipt. Trees Centr. Kalimantan 2 (1997) 641 [cited as (*Grewia?*) *Microcos stylocarpoides* Burret]. **Type:** Hallier 756, Borneo, Kalimantan, Soemedoene (holo BO).

Distribution: Endemic in Borneo (confined to Sarawak and Kalimantan).

Notes: *Microcos stylocarpoides* is closely related to *M. henrici* subsp. *acuta*. In both taxa the leaves are subcoriaceous, elliptic or obovate, and with flattened midrib and secondary veins above. In addition, the side axes of the inflorescences bear bracteole and peduncle scars, the lower part of the androgynophore is obovate in side view, and the style is sparsely stellate-hairy for at least a quarter of its length. *Microcos stylocarpoides* differs from *M. henrici* subsp. *acuta* mainly in having obovoid flower buds (vs. narrowly oblong), linear sepals (vs. oblong), subglobose or broadly ellipsoid ovary without ridges (vs. ellipsoid with 6 distinct and sharp ridges), and pyriform fruits without ridges (vs. ellipsoid or obovoid with 6 distinct ridges).

23. *Microcos subcordifolia* R.C.K.Chung

Microcos subcordifolia R.C.K.Chung, Kew Bull. 58 (2003) 339, fig. 4. **Type:** Kirkup & Thomas DK 727, Borneo, Brunei, Tutong, Lamunin, Kampung Menengah (holo KEP [barcode 77837]; iso BRUN, KEP [barcodes 77838–77840]).

Distribution: Endemic in Borneo (confined to Sarawak and Brunei).

24. *Microcos subepetala* Stapf ex Ridl.

Microcos subepetala Stapf ex Ridl., Bull. Misc. Inform., Kew (1938) 228; Masamune, En. Phan. Born. (1942) 450. **Type:** Haviland 1885, Borneo, Sarawak, Kuching (holo K).

Distribution: Endemic in Borneo (confined to Sarawak and Sabah).

Notes: The species is characterised by its glabrous twigs, conspicuously small elliptic or ovate leaves, glabrous and subcoriaceous leaves with hardly prominent venation, 4–6(–8) secondary veins, dense Type A or Type B panicles, and glabrous ovary. Specimens from Sarawak consistently have four pairs of secondary veins and pocket-type domatia, while those from Sabah have 4–8 pairs of secondary veins and domatia are absent.

The species is closely related to *M. antidesmifolia* var. *hirsuta* in

leaf shape but can be distinguished by its subcoriaceous leaves with a pointed tip, densely flowered inflorescences, broadly obovoid flower buds, cup-shaped lower part of the androgynophore, and glabrous ovary.

25. *Microcos sumatrana* (Baker f.) Burret

Microcos sumatrana (Baker f.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 783; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 241; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 358; Kessler *et al.*, Checkl. Tree Fl. Balikpapan-Samarinda Area (1992) 66. — *Grewia sumatrana* Baker f., J. Bot. 62 (1924) 13. **Type:** Forbes 2684, S Sumatra, Palembang, Batoe Pantjeh, Moesi River (lecto L [no. 908.140.744], here designated; isolecto L [nos. 908.140.1824, 409657]).

Distribution: Sumatra and Borneo (Sarawak, Sabah, Brunei, and Kalimantan).

Notes: See note under *M. gracilis*.

26. *Microcos tomentosa* Sm.

Microcos tomentosa Sm. in Rees, Cycl. 23, 2, 46 (1813) 2; Jack in Hooker, Bot. Misc. 1, 3 (1830) 281, *t.* 60; Don, Gen. Hist. 1 (1831) 551; Backer & Bakhuizen f., Fl. Java 1 (1964) 393; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 241; Phengklai, Thai For. Bull., Bot. 16 (1986) 52, f. 23; Phengklai, Fl. Thailand 6, 1 (1993) 37, f. 23; Turner, Gard. Bull. Sing. 47 (1995) 487. — *Grewia paniculata* Roxb. ex DC., Prodr. 1 (1824) 510; Blume, Bijdr. Fl. Ned. Ind 3 (1825) 115; Roxburgh, Fl. Ind. ed. 1832, 2 (1832) 591; Miquel, Fl. Ind. Bat. 1, 2, 2 (1859) 203; Masters in Hooker f., Fl. Brit. India 1, 2 (1874) 393 (*excl. Ins. Philipp.*); King, J. As. Soc. Beng. 60, 2 (1891) 110; Pierre, Fl. Forest. Cochinch. 11 (1888) *t.* 153; Gagnepain in Lecomte, Not. Syst. 1 (1909) 131 (*excl. Ins. Philipp.*), in M.H.Lecomte, Fl. Indo-Chine 1, 5 (1911) 544; Koorders, Exkurs.-Fl. Java 2 (1912) 577; Koorders & Valeton, Bijdr. Boomsoort. Java 1 (1894) 225, Atlas Baumart. Java 2, 8 (1914) figs. 393 & 394; Ridley, Fl. Malay Penins. 1 (1922) 300; Kochummen in Whitmore, Tree Fl. Malaya 2 (1973) 397; Whitmore & Tantra, Tree Fl. Indon., Checkl. Sumatra (1986) 241; Corner, Wayside Trees Malaya 3rd edition, 2 (1988) 734. **Type:** Roxburgh *s.n.* in Herb. EIC 1097B, buds & fl., Peninsular Malaysia, Penang (holo K-W, photo; iso BR [barcode BR-S.P. 817069], photocopy). *Grewia blumei* Hassk. in Hoeven & de Vriese, Tijdschr. Nat. Geschied. 12

(1845) 130; Miquel, Fl. Ind. Bat. 1, 2, 2 (1859) 203. **Type:** *Teijsmann s.n.*, Java (*n.v.*).

Grewia cumingiana Turcz., Bull. Soc. Natural. Moscou 1854, 31, 1 (1858) 231. **Type:** *Cuming s.n.*, Peninsular Malaysia (B†).

Distribution: Myanmar (*fide* Phengklai 1993), S China (*fide* Phengklai 1993), Indo-China (*fide* Phengklai 1993), Thailand, Sumatra, Peninsular Malaysia, Singapore, Java, Borneo, and the Philippines (*fide* Phengklai 1993). In Peninsular Malaysia, this species is common throughout except in the southern states.

Notes: *Microcos tomentosa* is a new record for Borneo with single collection from Kalimantan (*de Vriese 111* = L sheet nos. 899.300.63 & 899.300.64). It is closely related to *M. paniculata* in having peduncles, which arch out and droop, and in its curved-striate exocarp. However, the two species can be distinguished by characters of their leaves, flowers and fruits.

27. *Microcos triflora* (Blanco) R.C.K.Chung

Microcos triflora (Blanco) R.C.K.Chung, Kew Bull. 58 (2003) 346. – *Helianthemum triflorum* Blanco, Fl. Filip., ed. 2 (1845) 309, Fl. Filip., ed. 3, 2, 12/13 (1878) 208, *non Grewia triflora* (Bojer) Walp., Repert. Bot. Syst. 5, 1 (1845) 119; Merrill, Sp. Blancoan. (1918) 250. **Type:** *Sp. Blancoan. 864*, the Philippines, Luzon Laguna, Mt. Maquiling (neo US [barcode US 904559], “illustrative specimen” of Merr., Sp. Blancoan. (1918) 250, designated by Chung, 2003; isoneo L [no. 921.22.116], PNH†). *Grewia stylocarpa* Warb. in Perkins, Fragm. Fl. Philipp. 1 (1904) 104; Gagnepain in Lecomte, Not. Syst. 1 (1909) 131; Merrill, Philipp. J. Sci. 1 (1906) Suppl. 90, Sp. Blancoan. (1918) 250, Enum. Philipp. Fl. Pl. 3, 1 (1923) 27; Anderson, Checkl. Trees Sarawak (1980) 338; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 447. – *Microcos stylocarpa* (Warb.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 780; Whitmore *et al.* (eds.), Tree Fl. Indon., Checkl. Kalimantan 2, 1 (1990) 358; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 324; Boer & Sosef in Sosef *et al.*, Pl. Resources of South-East Asia 5, 3 (1998) 381. **Syntypes:** *Warburg 11870*, the Philippines, N Luzon, Malunu (B†, PNH†); *Warburg 13072*, the Philippines, C Luzon, Tayabas, Sampaloc (B†, PNH†).

Distribution: Borneo, the Philippines and Sulawesi.

Notes: Two varieties are recognised in Borneo.

a. var. triflora

Distribution: Borneo (Sarawak, Sabah, Brunei, and Kalimantan), the Philippines and Sulawesi.

b. var. longipetiolata (Merr.) R.C.K.Chung

Microcos triflora (Blanco) R.C.K.Chung var. *longipetiolata* (Merr.) R.C.K.Chung, Kew Bull. 58 (2003) 347. – *Grewia stylocarpa* Warb. var. *longipetiolata* Merr., J. Str. Br. R. As. Soc. 76 (1917) 97; Merrill, J. Str. Br. Roy. As. Soc., Spec. No. (1921) 373; Ashton, Man. Non-Dipt. Trees Sarawak 2 (1988) 447. – *Microcos stylocarpa* (Warb.) Burret var. *longipetiolata* (Merr.) Burret, Notizbl. Bot. Gart. Berl.-Dahl. 9 (1926) 780; Merrill, Univ. Calif. Publ. Bot. 15 (1929) 186; Masamune, En. Phan. Born. (1942) 450. **Type:** *Villamil* 243, Borneo, Sabah, Kalabakan watershed (holo K; iso BO, SING, US).

Microcos havilandii Ridl., Bull. Misc. Inform., Kew (1938) 228; Masamune, En. Phan. Born. (1942) 450. **Type:** *Haviland* 2332, Borneo, Sarawak, Kapit, Rejang (A, K, SAR, SING).

Distribution: Endemic in Borneo (Sarawak, Sabah and Brunei).

Excluded species

Microcos longipetiolata Kosterm., Reinwardtia 6, 3 (1962) 301. **Type:** *Meyer* SAN 19494 (holo K; iso SAN), Borneo, Sabah, Tawau, Tawau FR = *Scaphium longipetiolatum* (Kosterm.) Kosterm. (Sterculiaceae). See: Kostermans, Bull. Bot. Surv. India 7 (1965) 128.

Acknowledgements

We acknowledge the generosity of the directors, keepers and curators of herbaria (A, B, BM, BO, BOL, BR, BRUN, C, CAL, FL, G, GRA, K, KEP, KLU, L, MEL, NY, P, PNH, PRE, S, SAN, SAR, SING, U, UC, UKMB, US, Z and the Kinabalu National Park, Sabah) for the loan of specimens and facilities rendered. We are also grateful to Dr Dan H. Nicholson (United States National Herbarium, Washington DC) and Dr J. F. Veldkamp (Nationaal Herbarium Nederland, Leiden) who helped clarify some nomenclature problems, Dr Peter C. van Welzen, Dr Ding Hou (Nationaal Herbarium Nederland, Leiden) and Dr Martin Cheek (Royal Botanic Gardens, Kew) for their help in sourcing references and materials.

This study was supported financially by IRPA grants 01-04-01-024 (RMKe-7), 09-04-01-0073-EA001 (RMKe-8) and University of Malaya postgraduate research grants 489/97, 225/98, and 209/99.

References

- Anderson, J. A. R. 1980. *A Checklist of the Trees of Sarawak*. Dewan Bahasa & Pustaka Sarawak Branch, Kuching, Malaysia.
- Argent, G., A. Saridan, E. J. F. Campbell, P. Wilkie, G. Fairweather, J. T. Hadiah, D. J. Middleton, C. Pendry, M. Pinard, M. Warwick and K. S. Yulita (eds.) 1997. *Manual of the Larger and More Important Non-Dipterocarp Trees of Central Kalimantan Indonesia*. Forest Research Institute, Samarinda, Indonesia.
- Ashton, P. S. 1988. *Manual of the Non-Dipterocarp Trees of Sarawak*. 1st edition. Dewan Bahasa dan Pustaka, Sarawak Branch, Kuching, Malaysia.
- Baker, E. G. f. 1924. Polypetalae. In: Rendle, A. B. (ed.), Dr. H. O. Forbes's Malayan Plants. *Journal of Botany* Supplement 62. p. 13.
- Bayer, C. and K. Kubitzki. 2003. Malvaceae. In: K. Kubitzki and C. Bayer (eds.), *The Families and Genera of Vascular Plants. Flowering Plants Dicotyledons*. **5**: 225–311.
- Bayer, C., M. F. Fay, A. Y. de Bruijn, V. Savolainen, C. M. Morton, K. Kubitzki, W. S. Alverson and M. W. Chase. 1999. Support for an expanded family concept of Malvaceae within a recircumscribed order Malvales: a combined analysis of plastid *atpB* and *rbcL* DNA sequences. *Botanical Journal of the Linnean Society*. **129**: 267–303.
- Boer, E. and M. S. M. Sosef. 1998. *Microcos* L. In: M. S. M. Sosef, L. T. Hong and S. Prawirohatmodjo (eds.), *Timber Trees: Lesser-known Timbers. Plant Resources of South-East Asia*. **5**(3): 378–381.
- Burret, M. 1926. Beiträge zur kenntnis der Tiliaceae I. *Notizblatt des Botanischen Gartens und Museum zu Berlin-Dahlem*. **9**: 592–880.
- Burret, M. 1934. Beiträge zur kenntnis der Tiliaceae III. *Notizblatt des Botanischen Gartens und Museum zu Berlin-Dahlem*. **12**: 162–165.
- Chung, R. C. K. 2001. *Taxonomic and Micromorphological Studies of Grewia L. and Microcos L. (Tiliaceae) in Peninsular Malaysia and Borneo*. Unpublished PhD Thesis, University of Malaya, Kuala Lumpur, Malaysia.
- Chung, R. C. K. 2002. Leaf epidermal micromorphology of *Grewia* L. and

- Microcos* L. (Tiliaceae) in Peninsular Malaysia and Borneo. *Gardens' Bulletin Singapore*. **54**: 263–286.
- Chung, R. C. K. 2003. New taxa and new combinations of *Microcos* (Tiliaceae) from Peninsular Malaysia and Borneo. *Kew Bulletin*. **58**: 329–349.
- Chung, R. C. K., E. Soepadmo and A. L. Lim. 2003. The significance of pollen morphology in the taxonomy of *Grewia* and *Microcos* (Tiliaceae) in Peninsular Malaysia and Borneo. *Gardens' Bulletin Singapore*. **55**: 239–256.
- Chung, R. C. K., S. C. Lim, A. L. Lim and E. Soepadmo. 2005. Wood anatomy of *Grewia* and *Microcos* from Peninsular Malaysia and Borneo. *Journal of Tropical Forest Science*. **17**: 175–196.
- Coode, M. J. E., J. Dransfield, L. L. Forman, D. W. Kirkup and M. S. Idris. 1996. *A Checklist of the Flowering Plants and Gymnosperms of Brunei Darussalam*. Ministry of Industry and Primary Resources, Brunei Darussalam.
- Corner, E. J. H. 1939. Notes on the systematics and distribution of Malayan phanerogams III. *Gardens' Bulletin Straits Settlements*. **10**: 239–329.
- Greuter, W., J. McNeill, F. R. Barrie, H. -M. Burdet, V. Demoulin, T. S. Filguerias, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland and D. L. Hawksworth (editors and compilers) 2000. *International Code of Botanical Nomenclature (Saint Louis Code)*. *Regnum Veg.* 138 Koeltz Scientific Books, Königstein, Germany.
- Kessler, P. J. A. and K. Sidiyasa. 1994. *Tree of the Balikpapan-Samarinda Area, East Kalimantan, Indonesia*. Tropenbos Series No. 7. The Tropenbos Foundation, Wageningen, The Netherlands.
- Kessler, P. J. A., K. Sidiyasa, Ambriansyah and Z. Arifin. 1992. *Checklist for a Tree Flora of the Balikpapan-Samarinda Area, East Kalimantan, Indonesia*. The Tropenbos Foundation, Wageningen, The Netherlands.
- Linnaeus, C. 1753. *Species Plantarum*. Holmiae, Stockholm, Sweden.
- Linnaeus, C. 1767. *Systema Naturae* ed. 12. Volume 1, part 2. Holmiae, Stockholm, Sweden.
- Masamune, G. 1942. Tiliaceae. In: *Enumeratio Phanerogamarum Bornearum*. Taiwan Sotokufu Gaijibu, Taihoku, Japan.

- Merrill, E. D. 1921. A bibliographic enumeration of Bornean plants. *Journal of the Strait Branch of the Royal Asiatic Society*, special number.
- Rao, R. S. 1949. *Microcos blattaefolia* (Corner) Seshagiri Rao, *nov. comb.* *Journal of the Bombay Natural History Society*. **48**: 299–302.
- Ridley, H. N. 1933. LXII. Contributions towards a flora of British North Borneo III. *Bulletin of Miscellaneous Information*, Kew: 487–495.
- Ridley, H. N. 1938. XXXV. Additional to the flora of Borneo and other Malay Islands IX (Tiliaceae). *Bulletin of Miscellaneous Information*, Kew. 221–242.
- Steenis, C. G. G. J. van (compiler) 1954. *Numerical List of the Collections of Haviland in Borneo*. Flora Malesiana Foundation, Leiden, The Netherlands.
- The International Plant Names Index. 2005. Published on the internet <http://www.ipni.org> (accessed 21 February 2005).
- Whitmore, T. C., I. G. M. Tantra and U. Sutisna (eds.) 1990. *Tree Flora of Indonesia Check List for Kalimantan*. Part 2, 1. Forest Research and Development Centre, Bogor, Indonesia.

Identification list

The number after the collector numbers refers to the following *Microcos* taxa. When the number of the collection is not available or unknown then the dates or sheet numbers are mentioned between brackets.

- | | |
|--|---|
| 1 = <i>M. antidesmifolia</i> var. <i>hirsuta</i> | 15 = <i>M. opaca</i> |
| 2 = <i>M. borneensis</i> | 16 = <i>M. ossea</i> |
| 3 = <i>M. cinnamomifolia</i> | 17 = <i>M. pachyphylla</i> |
| 4 = <i>M. crassifolia</i> | 18 = <i>M. pearsonii</i> |
| 5 = <i>M. dulitensis</i> | 19 = <i>M. phaneroneura</i> |
| 6 = <i>M. fibrocarpa</i> | 20 = <i>M. reticulata</i> |
| 7 = <i>M. gracilis</i> | 21 = <i>M. riparia</i> |
| 8 = <i>M. henrici</i> subsp. <i>acuta</i> | 22 = <i>M. stylocarpoides</i> |
| 9 = <i>M. hirsuta</i> | 23 = <i>M. subcordifolia</i> |
| 10 = <i>M. kinabaluensis</i> | 24 = <i>M. subepetala</i> |
| 11 = <i>M. latifolia</i> | 25 = <i>M. sumatrana</i> |
| 12 = <i>M. latistipulata</i> var. <i>latistipulata</i> | 26 = <i>M. tomentosa</i> |
| 13 = <i>M. laurifolia</i> | 27a = <i>M. triflora</i> var. <i>triflora</i> |
| 14 = <i>M. membranifolia</i> | 27b = <i>M. triflora</i> var. <i>longipetiolata</i> |

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